

1 WHAT IS CLAIMED IS:

1. A secondary battery having a negative pole substantially made of a negative pole activating material, a positive pole substantially made of a negative pole activating material disposed while interposing a separator from said negative pole and an electrolyte or an electrolytic solution (electrolytic liquid) held between said negative pole and said positive pole, said secondary battery comprising:

10 a film which covers the surface of said negative pole and through which ions relating to battery reactions are able to pass.

2. A secondary battery according to claim 1, wherein said film has a molecular structure or apertures having gaps larger than the ions relating to said battery reactions.

3. A secondary battery according to claim 1, wherein said film has a molecular structure or apertures through which the ions relating to said battery reactions are able to pass but through which a negative pole activating material precipitated to said negative pole at the time of charge cannot pass.

25

4. A secondary battery according to claim 1, wherein said film is stable such that said film does not

*Sub
Bl 7*

294

1 react with said electrolyte or said electrolytic
solution and said film cannot be dissolved by the same.

5 5. A secondary battery according to claim 1,
wherein said film has an electron donative element or a
group.

10 6. A secondary battery according to claim 5,
wherein said electron donative element of said film has
an unpaired electron, a paired electron or electron d.

15 7. A secondary battery according to claim 5,
wherein said electron donative group of said film has
electron π . *A*

20 8. A secondary battery according to claim 5 or 6,
wherein said electron denative element of said film has
one or more types of elements selected from a group
consisting of oxygen, nitrogen and sulfur.

25 9. A secondary battery according to claim 1,
wherein said film is in the form of a large ring
compound structure.

10. A secondary battery according to claim 1,
wherein said film is in the form of an aromatic ring
structure.

1 11. A secondary battery according to claim 1,
wherein said film is fluororesin.

5 12. A secondary battery according to claim 1,
wherein said film is in the form of an ether bond
structure.

10 13. A secondary battery according to claim 1,
wherein said film has a carbonyl group.

14. A secondary battery according to claim 1,
wherein said film is in the form of a structure in which
phosphorus atoms and nitrogen atoms are alternately
double-bonded in a phosphorus-nitrogen manner.

15 15. A secondary battery according to claim 1,
wherein said film is made of a glass-type metal oxide.

20 16. A secondary battery according to claim 1,
wherein said film has a polymer structure.

17. A secondary battery according to claim 1,
wherein said film has a crosslinked polymer structure.

25 18. A secondary battery according to claim 1,
wherein said film includes conductor powder dispersed
therein.

1 19. A secondary battery according to claim 1,
wherein said negative pole activating material is
lithium or lithium alloy.

5 20. A secondary battery according to claim 1,
wherein said negative pole activating material is zinc
or zinc alloy.

10 21. A secondary battery according to claim 19,
wherein said surface of said negative pole covered with
said film is subjected to lipophilic treatment.

15 22. A secondary battery according to claim 20,
wherein said surface of said negative pole covered with
said film is subjected to hydrophilic treatment.

20 23. A secondary battery according to claim 1,
wherein at least the surface of said separator opposing
said negative pole is covered with the same material
which forms said film.

25 24. A secondary battery having a negative pole
substantially made of a negative pole activating
material, a positive pole substantially made of a
negative pole activating material disposed while
interposing a separator from said negative pole and an
electrolyte or an electrolytic solution (electrolytic

1 liquid) held between said negative pole and said
positive pole, said secondary battery comprising:
at least a surface of said negative pole
opposing said positive pole is treated with a reactive
5 and gaseous material containing a nitrogen element or a
halogen element.

25. A secondary battery according to claim 24,
wherein said reactive and gaseous materials a plasma-
10 type material.

26. A secondary battery according to claim 24,
wherein said material containing nitrogen is one or more
types of materials selected from a group consisting of
15 nitrogen, ammonia and nitrogen trifluoride.

27. A secondary battery according to claim 24,
wherein said material containing said halogen element
is one or more types of materials selected from a group
20 consisting of fluorine, chlorine, hydrogen fluoride,
hydrogen chloride, nitrogen trifluoride and a carbon
halide such as carbon tetrafluoride.

28. A secondary battery according to claim 24,
25 wherein one or more types of gases selected from a group
consisting of oxygen gas, hydrogen gas, argon gas,
helium gas and xenon gas are added to said reactive and

1 gaseous raw material gas containing the nitrogen element
or halogen element to treat the surface of said negative
pole.

5 29. A secondary battery according to claim 24,
wherein said reactive and gaseous material is a material
in a plasma state which treats the surface of said
lithium negative pole.

10 30. A secondary battery according to claim 24,
wherein said negative pole activating material is
lithium or lithium alloy.

15 31. A secondary battery having a negative pole
substantially made of a negative pole activating
material, a positive pole substantially made of a
negative pole activating material disposed while inter-
posing a separator from said negative pole and an
electrolyte or an electrolytic solution (electrolytic
20 liquid) held between said negative pole and said
positive pole, said secondary battery comprising:

one or more types of layers selected from a
group consisting of a conductor layer, a semiconductor
layer and an insulating layer and disposed between said
25 negative pole and said separator.

32. A secondary battery according to claim 31,

1 wherein said negative pole is made of lithium, lithium
alloy, zinc or zinc alloy.

33. A secondary battery according to claim 31,
5 wherein said conductor layer or said semiconductor layer
is made of one or more types of elements selected from
a group consisting of carbon, Ni, Ti, Pt and Si.

34. A secondary battery according to claim 31,
10 wherein said insulating layer is one or more types of
insulators selected from a group consisting of halide,
nitride and carbide.

35. A secondary battery according to claim 31,
15 wherein a layer selected from a group consisting of
said conductor layer, said semiconductor layer and said
insulating layer is in contact with said negative pole
activating material.

20 36. A secondary battery according to claim 31,
wherein a layer selected from a group consisting of said
conductor layer, said semiconductor layer and said
insulating layer is in contact with said separator.

25 37. A secondary battery according to claim 31,
wherein a layer selected from a group consisting of said
conductor layer, said semiconductor layer and said

1 insulating layer covers at least the surface of said
negative pole activating material adjacent to said
separator.

5 38. A secondary battery according to claim 31,
wherein a layer selected from a group consisting of said
conductor layer, said semiconductor layer and said
insulating layer is pressed and secured to the surface
of said negative pole activating material.

10

39. A secondary battery according to claim 31, wherein a layer selected from a group consisting of said conductor layer, said semiconductor layer and said insulating layer covers at least the surface of said separator adjacent to said negative pole.

15

40. A secondary battery according to claim 36,
wherein a layer selected from a group consisting of said
conductor layer, said semiconductor layer and said
insulating layer is pressed and secured to said
separator.

41. A secondary battery according to claim 31,
wherein said conductor layer is made of carbon fiber
25 having a specific area of $10 \text{ m}^2/\text{g}$ and a void ratio of
50 % or more.

1 42. A secondary battery having a negative pole
made of a negative pole activating material and a
positive pole made of a positive pole activating
material and arranged in such a manner that said
5 negative pole activating material and said positive pole
activating material are separated from each other by a
separator, said secondary battery comprising:
at least a multi-layer metal oxide formed
between said positive pole and said negative pole.

10

43. A secondary battery according to claim 42,
wherein said multi-layer metal oxide contains one or
more types of materials selected from a group consisting
of alumina, titanium oxide, silica, selenium oxide,
15 zirconia oxide, magnesium oxide, chrome oxide, calcium
oxide, tin oxide, indium oxide and germanium oxide.

10
20 44. A secondary battery according to claim 42,
wherein said multi-layer metal oxide is formed by a mold
made of bimolecular film.

25 45. A secondary battery according to claim 44,
wherein said bimolecular film is a compound (a
amphipathic material) having both hydrophobic group and
a hydrophilic group.

46. A secondary battery according to claim 44,

0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179
180
181
182
183
184
185
186
187
188
189
190
191
192
193
194
195
196
197
198
199
200
201
202
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217
218
219
220
221
222
223
224
225
226
227
228
229
2210
2211
2212
2213
2214
2215
2216
2217
2218
2219
2220
2221
2222
2223
2224
2225
2226
2227
2228
2229
2230
2231
2232
2233
2234
2235
2236
2237
2238
2239
22310
22311
22312
22313
22314
22315
22316
22317
22318
22319
22320
22321
22322
22323
22324
22325
22326
22327
22328
22329
22330
22331
22332
22333
22334
22335
22336
22337
22338
22339
22340
22341
22342
22343
22344
22345
22346
22347
22348
22349
22350
22351
22352
22353
22354
22355
22356
22357
22358
22359
22360
22361
22362
22363
22364
22365
22366
22367
22368
22369
22370
22371
22372
22373
22374
22375
22376
22377
22378
22379
22380
22381
22382
22383
22384
22385
22386
22387
22388
22389
22390
22391
22392
22393
22394
22395
22396
22397
22398
22399
223100
223101
223102
223103
223104
223105
223106
223107
223108
223109
223110
223111
223112
223113
223114
223115
223116
223117
223118
223119
223120
223121
223122
223123
223124
223125
223126
223127
223128
223129
223130
223131
223132
223133
223134
223135
223136
223137
223138
223139
223140
223141
223142
223143
223144
223145
223146
223147
223148
223149
223150
223151
223152
223153
223154
223155
223156
223157
223158
223159
223160
223161
223162
223163
223164
223165
223166
223167
223168
223169
223170
223171
223172
223173
223174
223175
223176
223177
223178
223179
223180
223181
223182
223183
223184
223185
223186
223187
223188
223189
223190
223191
223192
223193
223194
223195
223196
223197
223198
223199
223200
223201
223202
223203
223204
223205
223206
223207
223208
223209
223210
223211
223212
223213
223214
223215
223216
223217
223218
223219
223220
223221
223222
223223
223224
223225
223226
223227
223228
223229
223230
223231
223232
223233
223234
223235
223236
223237
223238
223239
223240
223241
223242
223243
223244
223245
223246
223247
223248
223249
223250
223251
223252
223253
223254
223255
223256
223257
223258
223259
223260
223261
223262
223263
223264
223265
223266
223267
223268
223269
223270
223271
223272
223273
223274
223275
223276
223277
223278
223279
223280
223281
223282
223283
223284
223285
223286
223287
223288
223289
223290
223291
223292
223293
223294
223295
223296
223297
223298
223299
223300
223301
223302
223303
223304
223305
223306
223307
223308
223309
223310
223311
223312
223313
223314
223315
223316
223317
223318
223319
223320
223321
223322
223323
223324
223325
223326
223327
223328
223329
223330
223331
223332
223333
223334
223335
223336
223337
223338
223339
223340
223341
223342
223343
223344
223345
223346
223347
223348
223349
223350
223351
223352
223353
223354
223355
223356
223357
223358
223359
223360
223361
223362
223363
223364
223365
223366
223367
223368
223369
223370
223371
223372
223373
223374
223375
223376
223377
223378
223379
223380
223381
223382
223383
223384
223385
223386
223387
223388
223389
223390
223391
223392
223393
223394
223395
223396
223397
223398
223399
223400
223401
223402
223403
223404
223405
223406
223407
223408
223409
223410
223411
223412
223413
223414
223415
223416
223417
223418
223419
223420
223421
223422
223423
223424
223425
223426
223427
223428
223429
223430
223431
223432
223433
223434
223435
223436
223437
223438
223439
223440
223441
223442
223443
223444
223445
223446
223447
223448
223449
223450
223451
223452
223453
223454
223455
223456
223457
223458
223459
223460
223461
223462
223463
223464
223465
223466
223467
223468
223469
223470
223471
223472
223473
223474
223475
223476
223477
223478
223479
223480
223481
223482
223483
223484
223485
223486
223487
223488
223489
223490
223491
223492
223493
223494
223495
223496
223497
223498
223499
223500
223501
223502
223503
223504
223505
223506
223507
223508
223509
223510
223511
223512
223513
223514
223515
223516
223517
223518
223519
223520
223521
223522
223523
223524
223525
223526
223527
223528
223529
223530
223531
223532
223533
223534
223535
223536
223537
223538
223539
223540
223541
223542
223543
223544
223545
223546
223547
223548
223549
223550
223551
223552
223553
223554
223555
223556
223557
223558
223559
223560
223561
223562
223563
223564
223565
223566
223567
223568
223569
223570
223571
223572
223573
223574
223575
223576
223577
223578
223579
223580
223581
223582
223583
223584
223585
223586
223587
223588
223589
223590
223591
223592
223593
223594
223595
223596
223597
223598
223599
223600
223601
223602
223603
223604
223605
223606
223607
223608
223609
223610
223611
223612
223613
223614
223615
223616
223617
223618
223619
223620
223621
223622
223623
223624
223625
223626
223627
223628
223629
223630
223631
223632
223633
223634
223635
223636
223637
223638
223639
223640
223641
223642
223643
223644
223645
223646
223647
223648
223649
223650
223651
223652
223653
223654
223655
223656
223657
223658
223659
223660
223661
223662
223663
223664
223665
223666
223667
223668
223669
223670
223671
223672
223673
223674
223675
223676
223677
223678
223679
223680
223681
223682
223683
223684
223685
223686
223687
223688
223689
223690
223691
223692
223693
223694
223695
223696
223697
223698
223699
223700
223701
223702
223703
223704
223705
223706
223707
223708
223709
223710
223711
223712
223713
223714
223715
223716
223717
223718
223719
223720
223721
223722
223723
223724
223725
223726
223727
223728
223729
223730
223731
223732
223733
223734
223735
223736
223737
223738
223739
223740
223741
223742
223743
223744
223745
223746
223747
223748
223749
223750
223751
223752
223753
223754
223755
223756
223757
223758
223759
223760
223761
223762
223763
223764
223765
223766
223767
223768
223769
223770
223771
223772
223773
223774
223775
223776
223777
223778
223779
223780
223781
223782
223783
223784
223785
223786
223787
223788
223789
223790
223791
223792
223793
223794
223795
223796
223797
223798
223799
223800
223801
223802
223803
223804
223805
223806
223807
223808
223809
223810
223811
223812
223813
223814
223815
223816
223817
223818
223819
223820
223821
223822
223823
223824
223825
223826
223827
223828
223829
223830
223831
223832
223833
223834
223835
223836
223837
223838
223839
223840
223841
223842
223843
223844
223845
223846
223847
223848
223849
223850
223851
223852
223853
223854
223855
223856
223857
223858
223859
223860
223861
223862
223863
223864
223865
223866
223867
223868
223869
223870
223871
223872
223873
223874
223875
223876
223877
223878
223879
223880
223881
223882
223883
223884
223885
223886
223887
223888
223889
223890
223891
223892
223893
223894
223895
223896
223897
223898
223899
223900
223901
223902
223903
223904
223905
223906
223907
223908
223909
223910
223911
223912
223913
223914
223915
223916
223917
223918
223919
223920
223921
223922
223923
223924
223925
223926
223927
223928
223929
223930
223931
223932
223933
223934
223935
223936
223937
223938
223939
223940
223941
223942
223943
223944
223945
223946
223947
223948
223949
223950
223951
223952
223953
223954
223955
223956
223957
223958
223959
223960
223961
223962
223963
223964
223965
223966
223967
223968
223969
223970
223971
223972
223973
223974
223975
223976
223977
223978
223979
223980
223981
223982
223983
223984
223985
223986
223987
223988
223989
223990
223991
223992
223993
223994
223995
223996
223997
223998
223999
223999

1 wherein said bimolecular film is formed in a film shape
combining an amphipathic material and a polymer
compound.

5 47. A secondary battery according to claim 44,
wherein said bimolecular film is a reactant (polyion
complex) of an ionic amphipathic material and a polymer
electrolyte.

10 48. A secondary battery according to claim 42,
wherein said multi-layer metal oxide is a composite of
an organic polymer.

49. A secondary battery according to claim 42,
15 wherein said multi-layer metal oxide is a portion of
said separator.

50. A secondary battery according to claim 42,
wherein the surface of said positive pole made of said
20 positive pole activating material and opposing said
negative pole is covered with at least a film through
which ions relating to battery reactions are able to
pass.

25 51. A secondary battery according to claim 42,
wherein the surface of said negative pole made of said
negative pole activating material and opposing said

1 positive pole is covered with at least a film through
which ions relating to battery reactions are able to
pass.

5 52. A secondary battery according to claim 42,
wherein said film through which the ions relating to the
battery reactions are able to pass is made of a multi-
layer metal oxide prepared in a mold made of a
bimolecular film.

10 53. A secondary battery according to claim 42,
wherein said negative pole activating material is
lithium or lithium alloy.

15 54. A secondary battery according to claim 42,
wherein said negative pole activating material is zinc
or zinc alloy.

20 55. A secondary battery according to claim 42,
wherein said multi-layer metal oxide is subjected to
lipophilic treatment.

25 56. A secondary battery according to claim 42,
wherein said multi-layer metal oxide has a conductor
member on the surface thereof which opposes said
negative pole.

1 57. A secondary battery comprising:

a negative pole substantially made of a negative
pole activating material;

5 a positive pole substantially made of a negative
pole activating material disposed while interposing a
separator from said negative pole; and

an electrolyte or an electrolytic solution
(electrolytic liquid) held between said negative pole
and said positive pole, wherein

10 at least the surface of said positive pole
opposing said negative pole is covered with one or more
layers selected from a group consisting of an insulating
film, a semiconductor film and a composite film of an
insulating material and a semiconductor through which
15 ions relating to battery reactions are able to pass.

58. A secondary battery according to claim 57,
wherein said insulating member through which the ions
are able to pass is a large ring compound through which
20 the ions relating to the battery reactions are able to
pass.

59. A secondary battery according to claim 58,
wherein said large ring compound is a ring compound
25 having one or more types of structures selected from a
group consisting of a ring polyether, a ring polyamine,
ring polythioether, azacrown ether, ring thioether,

1 thiocrown ether, cryptand, cyclam, cyclodextrin,
cyclofan, phthalocyanin and porphyrin compound.

60. A secondary battery according to claim 57,
5 wherein said insulating member through which the ions
are able to pass is a polymer of a derivative of an
aromatic hydrocarbon.

61. A secondary battery according to claim 60,
10 wherein said derivative of the aromatic hydrocarbon is
one or more types of derivatives selected from a group
consisting of naphthalene, anthracene, phenanthrene,
naphthacene, pyrene, triphenylene, perillene, picene,
benzopyrene, coronene and ovalene.

15 62. A secondary battery according to claim 57,
wherein said insulating member through which the ions
are able to pass is fluororesin.

20 63. A secondary battery according to claim 62,
wherein said fluororesin has an ether bond.

64. A secondary battery according to claim 57,
wherein said insulating member through which the ions
25 are able to pass is silicone resin which is an organic
silicon compound.

1 65. A secondary battery according to claim 57,
wherein said insulating member through which the ions
are able to pass is a titanium polymer which is an
organic titanium compound.

5

66. A secondary battery according to claim 57,
wherein said insulating member through which the ions
are able to pass is a polymer in which phosphorus atoms
and nitrogen atoms alternately form phosphorus-nitrogen
double bonds.

10

67. A secondary battery according to claim 57,
wherein said insulating member through which the ions
are able to pass is inorganic glass mainly composed of
15 an inorganic oxide.

16

68. A secondary battery according to claim 67,
wherein said inorganic glass is combined with an organic
polymer.

20

69. A secondary battery according to claim 67,
wherein said inorganic oxide contains oxides of one or
more elements selected from a group consisting of
silicon, titanium, aluminum, magnesium, zirconium, lead
25 and calcium.

26

70. A secondary battery according to claim 57,

1 wherein said insulating member through which the ions
are able to pass is a carbide.

71. A secondary battery according to claim 57,
5 wherein said insulating member through which the ions
are able to pass is a nitride.

72. A secondary battery according to claim 57,
wherein said insulating member through which the ions
10 are able to pass is a halide.

73. A secondary battery according to claim 72,
wherein said halide is a fluoride.

15 74. A secondary battery according to claim 57,
wherein said insulating member through which the ions
are able to pass contains one or more types of elements
selected from a group consisting of carbon and silicon.

20 75. A secondary battery according to claim 57,
wherein the surface of said negative pole is covered
with a film through which ions relating to battery
reactions are able to pass.

25 76. A secondary battery according to claim 57,
wherein said negative pole is made of lithium or lithium
alloy and said ions relating to the reactions are

1 lithium ions.

77. A secondary battery according to claim 57,
wherein said negative pole is made of zinc or zinc alloy
5 and said ions relating to the reactions are hydroxide
ions.

78. A secondary battery comprising:
a negative pole substantially made of a negative
10 pole activating material;
a positive pole substantially made of a ~~negative~~
pole activating material disposed while interposing a
separator from said negative pole; and
an electrolyte or an electrolytic solution
15 (electrolytic liquid) held between said negative pole
and said positive pole, wherein
said positive pole activating material is mainly
composed of a compound of one or more types of transition
metal having a crystal grain size of 500 Å or less and a
20 group 6A element.

79. A secondary battery according to claim 78,
wherein said positive pole activating material is an
aggregate selected from a group consisting of amorphous,
25 microcrystal, a mixture of amorphous and microcrystal
and a mixture of amorphous, microcrystal and multi-
crystal.

1 80. A secondary battery according to claim 78,
wherein said positive pole activating material contains
hydrogen.

5 81. A secondary battery according to claim 80,
wherein said positive pole activating material has a
hydroxide.

10 82. A secondary battery according to claim 78,
wherein said positive pole activating material contains
one or more types of elements selected from a group
consisting of lithium, carbon, magnesium, sodium,
potassium, nitrogen, aluminum, calcium, barium, lead,
indium, boron, silicon, tin, phosphorus, arsenic,
15 antimony, bismuth, fluorine and chlorine.

20 83. A secondary battery according to claim 78,
wherein said group 6A element which is the main compo-
nent of said positive pole activating material is oxygen.

25 84. A secondary battery according to claim 78,
wherein said group 6A element which is the main component
of said positive pole activating material is sulfur.

25 85. A secondary battery according to claim 78,
wherein said positive pole activating material is
applied with coating treatment with a conductor.

1 86. A secondary battery according to claim 78,
wherein a positive pole activating material of a type in
which conductor powder serving as the core is covered
with a compound of said transition metal and said group
5 6A element is used.

10 87. A secondary battery according to claim 78,
wherein said positive pole activating material contains
one or more materials selected from a group consisting
10 of carbon material, a resin material and a metal
material mixed thereto to form a positive pole.

15 88. A secondary battery according to claim 78,
wherein said positive pole activating material is
subjected to lipophilic treatment.

20 89. A secondary battery according to claim 88,
wherein said lipophilic treatment is treatment using an
organic metal compound.

25 90. A secondary battery according to claim 87,
wherein said resin material contains one or more types
of resins selected from a group consisting of
fluororesin, polyethylene, polypropylene and silicon
resin.

91. A secondary battery according to claim 90,

1 wherein said resin material is a resin in the form of
liquid or molten liquid or a resin having a low melting
point.

5 92. A secondary battery according to claim 91,
wherein said resin is fluororesin having an ether bond.

93. A secondary battery according to claim 78,
wherein said negative pole activating material is
10 composed of one or more types of materials selected from
a group consisting of lithium, lithium alloy and carbon.

94. A secondary battery according to claim 78,
wherein the surface of said negative pole activating
15 material of said secondary battery is covered with a
film through which lithium ions are able to pass.

95. A secondary battery according to claim 78,
wherein said electrolyte is composed of at least an
20 alkali metal compound.

96. A secondary battery according to claim 78,
wherein said electrolyte is in a state selected from a
group consisting of a solid state, a molten liquid state
25 dissolved in a non-water-soluble solvent and a solid-
liquid state.

1 97. A method of manufacturing a positive pole
activating material of a secondary battery, said method
comprising the steps of:

5 forming a compound having a crystal grain size
of 500 Å or less and composed of transition metal and a
group 6A element by using a reaction selected from a
group consisting of a solution reaction, a gas phase
reaction and a melting and rapid cooling reaction.

10 98. A method of manufacturing a positive pole
activating material according to claim 97, wherein said
compound of said transition metal and said group 6A
element is an aggregate selected from a group consisting
of amorphous, microcrystal, a mixture of amorphous and
15 microcrystal and a mixture of amorphous, microcrystal
and multi-crystal.

20 99. A method of manufacturing a positive pole
activating material according to claim 97, wherein said
positive pole activating material is substantially
composed of a compound of said transition metal and said
group 6A element, the raw material of said transition
metal element of said compound of said transition metal
and said group 6A element being one or more types of
25 materials selected from a group consisting of said
transition metal, salt of said transition metal, an
organic metal compound of said transition metal, hydride

1 of said transition metal, hydrogated material of said
transition metal, carbonyl compound of said transition
metal and a transition metal oxide.

5 100. A method of manufacturing a positive pole
activating material according to claim 97, wherein said
positive pole activating material is composed of a
compound of said transition metal and said group 6A
element, the raw material of said group 6A element of
10 said compound of said transition metal and said group 6A
element being one or more types of materials selected
from a group consisting of water, alcohol, hydride,
hydrogated material and halide.

15 101. A method of manufacturing a positive pole
activating material according to claim 97, wherein said
group 6A element is oxygen.

20 102. A method of manufacturing a positive pole
activating material according to claim 97, wherein said
group 6A element is sulfur.

25 103. A method of manufacturing a positive pole
activating material according to claim 97, wherein said
process for forming said compound of said transition
metal and said group 6A element includes a process for
causing hydrogen to react.

1 104. A method of manufacturing a positive pole
activating material according to claim 97, wherein said
positive pole activating material is composed of a
compound of said transition metal and said group 6A
5 element and said solution reaction includes at least a
process for forming a hydroxide of said transition metal
by using one or more reactions selected from a group
consisting of a reaction between a salt of said
transition metal and alkali, a hydrolysis reaction of an
10 organic transition metal compound and a reaction between
said transition metal and alkali.

104. A method of manufacturing a positive pole
activating material according to claim 97, wherein said
gas phase reaction includes at least a process for
causing gasified transition metal salt or an organic
transition metal compound or vapor of said transition
metal and said group 6A element or a compound of said
group 6A element to react with each other in a gas phase
20 or a process for decomposing transition metal salt
containing gasified group 6A element or an organic
transition metal compound in a gas phase so that said
compound of said transition metal and said group 6A
element is prepared.

25

106. A method of manufacturing a positive pole
activating material according to claim 97, wherein said

1 activating material is composed of a compound of said
transition metal and said group 6A element and said
melting and rapid cooling reaction includes at least a
process for melting one or more types of materials
5 selected from a group consisting of said transition
metal and said transition metal compound to be caused to
react with one or more types of materials selected from
a group 6A element and said group 6A element compound
and rapidly cooling said reactant.

10

107. A method of manufacturing a positive pole
activating material according to claim 97, wherein said
positive pole activating material is composed of said
transition metal and said group 6A element and at least
15 of a process for applying supersonic vibrations is
provided.

108. A method of manufacturing a positive pole
activating material according to claim 99, wherein said
salt of said transition metal is one or more types of
20 salts selected from a group consisting of nitrate,
carbonate, sulfate, halide, phosphate, borate, salt of
organic acid and ammonia salt.

25 109. A method of manufacturing a positive pole
activating material according to claim 99, wherein said
organic transition metal compound is one or more types

1 of salts selected from a group consisting of metal alkoxide, acetylacetone, salt of octylic acid and naphthenate.

5 110. A method of manufacturing a positive pole activating material according to claim 104, wherein acid and/or alkali is added in said hydrolysis reaction of said organic transition metal compound.

10 111. A method of manufacturing a positive pole activating material according to claim 104 further comprising a dehydrating reaction process.

15 112. A method of manufacturing a positive pole activating material according to claim 104 further comprising a process for causing hydrogen sulfide to react.

20 113. A method of manufacturing a positive pole activating material according to claim 105, wherein a solid transition metal salt or a organic transition metal compound is heated to be formed into vapor or heated to be liquid and a carrier gas is bubbled as to be introduced into a reaction chamber or a solution 25 dissolved in a solvent is introduced into said reaction chamber while bubbling said carrier gas so that a gas phase reaction is caused to take place.

1 114. A method of manufacturing a positive pole
activating material according to claim 105, wherein said
liquid transition metal salt or said organic transition
metal compound is heated to be formed into vapor or
5 carrier gas is bubbled to be introduced into a reaction
chamber so that a gas phase reaction is caused to take
place.

10 115. A method of manufacturing a positive pole
activating material according to claim 106, wherein a
rapid cooling rate is 10^1 to 10^8 K per second.

15 116. A method of manufacturing a positive pole
activating material according to claim 97 and made of a
compound of said transition metal and said group 6A
element further comprising at least a step of adding one
or more types of elements selected from a group
consisting of lithium, carbon, magnesium, sodium,
potassium, nitrogen, aluminum, calcium, barium, lead,
20 indium, boron, silicon, tin, phosphorus, antimony,
bismuth, fluorine and chlorine.

25 117. A method of manufacturing a positive pole
activating material according to claim 116, wherein the
raw material of the additive elements to be added to
said positive pole activating material is one or more
types of materials selected from a group consisting of

1 said additive element, salt of said additive element, organic compound of said additive element, hydride of said additive element and hydrogated material of said additive element.

5

118. A method of manufacturing a positive pole activating material according to claim 97 further comprising a step of mixing conductor powder to be used as the core of said compound of said transition metal 10 and said group 6A element.

119. A method of manufacturing a positive pole activating material according to claim 97 further comprising a step of covering by using a conductor after 15 said compound of said transition metal and said group 6A element has been prepared.

120. A method of manufacturing a positive pole comprising the step of:

20 mixing one or more types or resins selected from a group consisting of fluorine resin, polyethylene, polypropylene and silicon resin into said positive pole activating material prepared by said manufacturing method according to claim 97.

25

121. A method of manufacturing a positive pole according to claim 120, wherein said resin material is

1 liquid or solution or low melting point resin.

122. A method of manufacturing a positive pole
according to claim 120, wherein said resin material is
5 fluorine resin having an ether bond.

ABO
A₃ >

10

15

20

25